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Navigation

INTERNATIONAL
CORRESPONDENCE SCHOOLS
SCRANTON, PA.

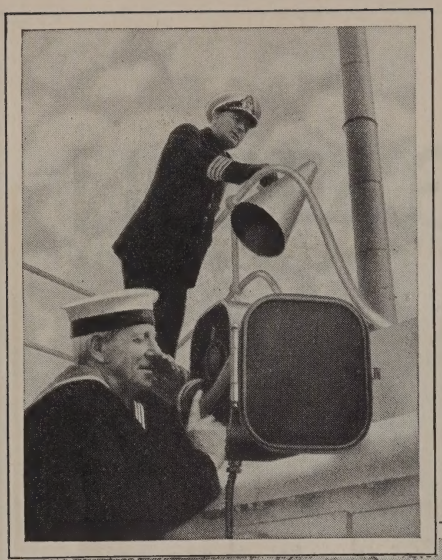
Photo by Courtesy of Hamburg-American Line

NAVIGATION

Training for men who would advance through study to those higher positions on shipboard which carry with them both honor and financial reward

International Correspondence Schools
Scranton, Pa.

Scientific Seamanship is Today's Demand



Left—Officer on the bridge directs the crew in casting off the lines.

Photos by courtesy of the Cunard Line

Navigation in practice.

When it's a matter of position, direction, and destination there is a multitude of factors to be reckoned with and the skilled navigator knows how to do it. He has to know—there can be no guesswork. Here are officers figuring it out.

MATSON NAVIGATION COMPANY

MATSON BUILDING
215 MARKET STREET

SAN FRANCISCO, CALIFORNIA, U.S.A.

H.W. Heuer, Chief Mate
s/s MAKIKI
San Francisco, Calif,
21 August 1930

Captain E.K. Roden, Director, Navy and Marine Division,
International Correspondence Schools

Scranton, Pa.

Dear Sir:

I thank you for your congratulations on my promotion to Chief Mate, and I wish to say that your course in Ocean Navigation has enabled me to make my promotion possible. I firmly believe that anyone completing the course will be a superior navigator, and second only to scientists and special Naval graduates.

Sincerely yours,

Ensign H.W. Heuer DM. U.S.N.R.

Wearing the Stripes of an Officer

SINCE the early days of history men have answered the call of the sea. Daring Vikings set forth on brave journeys in tiny ships. They were navigators famed more for their splendid courage than for their science. Since that day navigation has developed into a great science to which invention has contributed many wonderful instruments to insure safety on the seas.

This booklet is particularly for those who love the sea and who are ambitious to advance to the highest positions offered by maritime callings. To wear the stripes of an officer is no small honor. Those stripes are an indication of ability, fitness and willingness to assume responsibility. The safe conduct of a ship or of any department of a ship is not entrusted to the unfit.

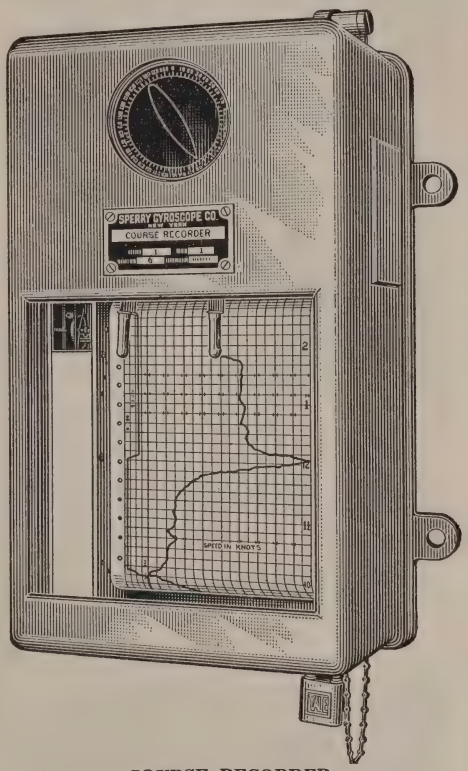
The good old days of the windjammers and the early ships "in steam" demanded expert seamanship—but they didn't begin to offer opportunity to ambitious men as do the days of the present. To command a great ocean liner calls for its captain and corps of junior officers. The departments of the modern liner are as varied as those of any great, well-organized business and, as in any business, those in charge must be men capable and trained.

EVERY ship of practically any type plying the waters of the great inland lakes of America, or up and down the coasts, or along the trans-oceanic lanes *must* have its full compliment of officers. And before any man can hope to take a position on the bridge he must *know* the science of navigation. The law requires it; owners demand it.

To take a great ocean liner out of the harbor and guide it across some thousands of miles of ocean—through storms, perhaps, or unforeseen emergencies—bringing ship, passengers and cargo safely to port is a task that commands the highest admiration. Or it may be a coastwise vessel, a giant freighter, a Great Lakes carrier—no matter. The law absolutely requires that any navigational officer must *know* navigation—and to prove that he knows it he must pass rigid examinations in various phases of the subject. That is why we say that wearing the stripes of an officer is an honor to which any seagoing man may be proud to aspire.

Officers of the Merchant Marine

In recent years the cost of modern ocean liners has run into millions of dollars. A single well-known transoceanic passenger ship represents an outlay of $10,000,000. Another ship that is now engaged in coastwise passenger and cargo trade runs into an expenditure of $8,000,000. Officers in charge of such valuable ships must be men of high professional standing. In addition to being a practical seaman, a deck officer must possess an absolutely sound and thorough knowledge of all methods tending to secure the safe navigation of such valuable floating property. Conditions at sea often place the officer on duty in a most trying position, with but a few moments to decide the proper action which may involve the safety of ship, cargo, and hundreds of lives of crew and passengers. The I.C.S. Nautical Courses are recommended to all officers who wish to increase their proficiency and further their own advancement to positions of higher income and importance. Hundreds of officers of deep-sea vessels, junior officers, pilots, and others have already enrolled in I.C.S. Nautical Courses in preparation for the examinations required for promotion.



COURSE RECORDER
Shows the Courses Run and Character of the Steering for Entire Voyage
Specimen Illustration from "The Compass, Part 1"

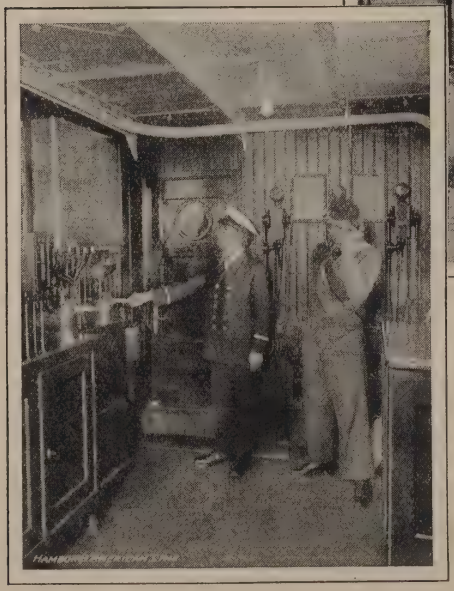
I.C.S. Courses Fundamental

I.C.S. courses in Navigation are fundamental. We start our students at the very beginning of Arithmetic and lead them lesson by lesson to the more advanced parts of the courses. Nothing is left to the imagination. Every standard method used in navigation is explained in minute detail.

There Can Be No Alibi for the Officer. He Must *Know*

Top—Men on the bridge get there by knowing. They must meet the rigid requirements imposed by owners and the law.

Right—An officer of the Dollar Line "shoots the sun."

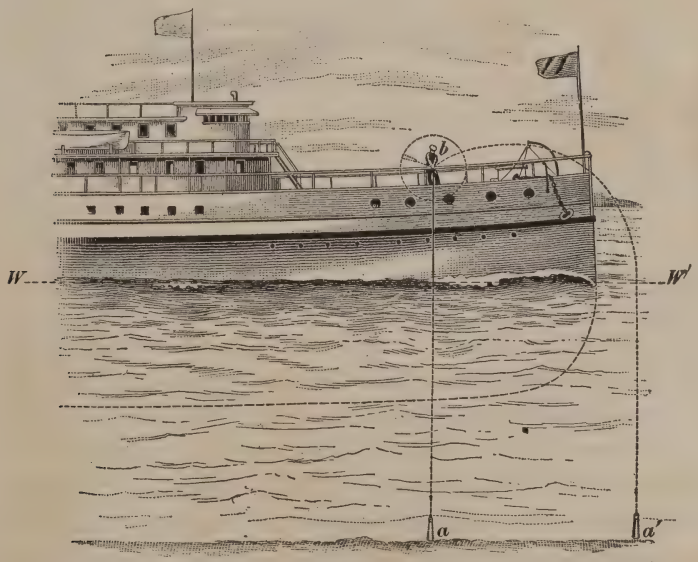


Left—Officer studying the charts of the bulkheads that provide for the safety of this Hamburg-American liner.

Safety and training are two great requirements imposed on those who follow the calling of the sea.

The Seaman Who Would Advance

The sailor, like any other person beginning at the bottom of his profession, has a natural desire to rise. He wishes to become an officer and, if possible, to command his own craft. But seamanship alone will not place him on the quarterdeck or on the bridge. He must, in addition, be a *first-class navigator*. To study navigation, he has had to throw up his job, come on land, and attend a nautical school. This necessity is now a thing of the past. The I.C.S. system of teaching navigation will enable him to get what he needs,



Sounding With the Hand Lead

Specimen Illustration From "Chart, Lead, and Log"

without coming on shore and at no expense other than the price of the Course. I.C.S. Courses begin at the very beginning, requiring only that the student be able to read and write. In order to become a deck officer the mariner must study and learn methods used in navigation. This knowledge cannot very well be "picked up" nor gotten from ordinary books.

For those who desire to prepare themselves for license examination in their spare time the I.C.S. Special Courses of Instruction in Ocean, Coastwise, and Lake Navigation cannot be equaled in thoroughness and practicability.

A School That Reaches You at Every Port

THE mariner who is constantly on the move from one port to another can study and acquire training almost as readily as though he were permanently located ashore. The International Correspondence Schools have provided for his advancement. Every provision has been made to render a valuable educational service promptly. Scores of men in the navy, in the merchant marine and elsewhere have found advancement through training secured by this system. Today, scores of others are getting instruction texts at one port; they study on the "watch below" while at sea, and mail their answers at the next port where other instruction texts are awaiting them. You need not leave the ship. The I.C.S. will keep in touch with you wherever you go.

A Word About Instruction Texts

LONG years ago we learned that ordinary texts on navigation (and other technical subjects as well) are very seldom adapted to the needs of the man who studies alone in his spare time. For such men there must be special texts that explain everything—every point and principle—so clearly that the meaning can be grasped and understood thoroughly. That is why so many thousands of men have been surprised at the progress they are able to make. Scores of illustrations help to make meanings clear and it is almost impossible to imagine the genuine interest which skilled instructors take in the training for success of every I.C.S. student.

It is these easy-to-understand texts, the whole-hearted interest of skilled instructors and the ambition of the student which make an unbeatable combination. Because of it many men on many seas are filling higher positions today.

Navigation for the Yacht Owner

THERE is great satisfaction in being a navigating owner. Even though licensed officers may be employed there is such satisfaction in knowing navigation that some of our most enthusiastic and successful students are those who study for the pleasure and sheer

satisfaction of knowing the science of navigation. Many of these will tell you that the satisfaction of treading the bridge with a navigator's right often exceeds the satisfaction of mere ownership.

While the training provided by I.C.S. courses meets the needs of navigators, it is easy for the non-technical to grasp, understand and apply.

To Steamship Owners and Officers

EVERY steamship company realizes that the successful operation of its fleet depends in no small degree on the efficiency of the personnel in charge of each ship operated by the company.

Intelligent and well-trained crews from the skipper down, mean better service, better handling of ship and cargo, resulting in an economic saving to the owners. A man who can meet an emergency either on deck or in the engine room and avert a threatening disaster is a real asset to any steamship company. Trouble, prevented at the start with the help of technically-trained men, may mean the saving of large repair bills later on.

For many years the International Correspondence Schools have trained men to become more valuable to their employers. I.C.S. courses in Navigation, Marine Engineering, Electrical Engineering, Steam and Gas Engineering, and Radio work have made it possible to train men into alert, efficient, and resourceful employes.

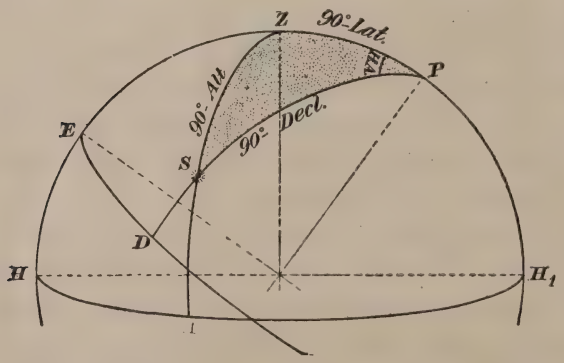
I.C.S. courses in Navigation have been adopted and are now being used by the U. S. Coast Guard Institute and the U. S. Marine Corps Institute in teaching navigation to men in these services. The requirements of these government institutions are most exacting, and for this reason I.C.S. texts and methods of teaching navigation by mail can be depended on for they meet and fulfill these requirements.

Opportunities in the Navy

DUE to the position of this country as a world power with vast commercial interests and coast lines to protect, the U. S. Navy must necessarily be kept at a high standard of strength and efficiency. At the same time the personnel that mans our ships must be well trained. The navy needs men in all trades and for this reason it offers an opportunity for men to learn trades through Navy trade schools maintained by the Navy. But here, as elsewhere, men are picked for brains and initiative. Only men who study are given a chance to enter the Navy trade schools and secure advancement.

Enlisted Men May Become Commissioned Officers

Until a few years ago promotion for enlisted men in the United States Navy was greatly restricted. A man well versed in the duties of his profession could become a warrant officer, but the rank of commissioned officer was out of his reach. Under the Naval Personnel Act 12 warrant officers may now be appointed every year to commissioned rank and 100 enlisted men under 20 years of age receive appointments to the Naval Academy. This means that a young man entering the service may rise in rank to become an admiral. But before he can advance he must pass a satisfactory examination and to prepare for this examination he must study and our instruction is particularly well suited to give him the knowledge of navigation and other subjects required for this purpose. That the I.C.S. method of preparation has proved fully adequate to their needs is shown by the fact that of one group of forty-two warrant officers that were appointed ensigns under the Act mentioned, thirty-three were students of the International Correspondence Schools.



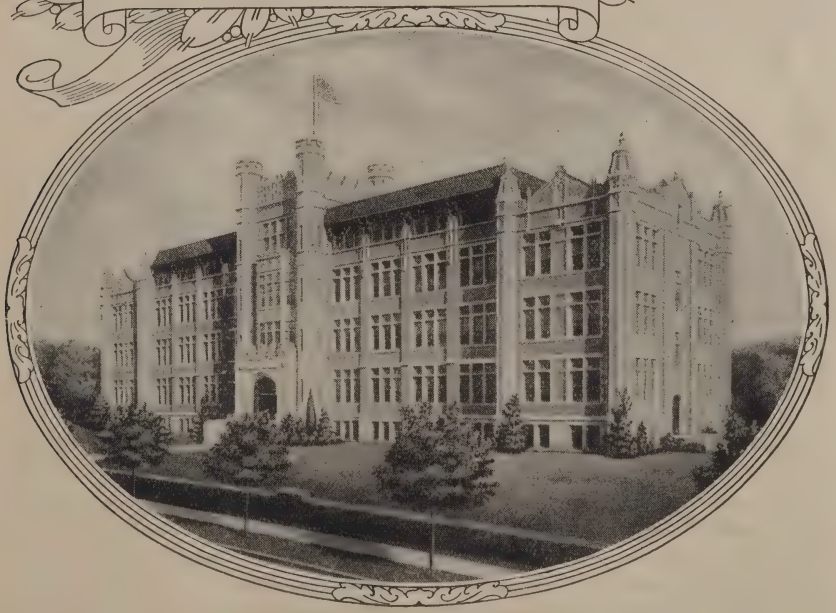
THE MOST IMPORTANT TRIANGLE ON THE CELESTIAL SPHERE
"Specimen Illustration From Longitude and Azimuth."

To ambitious men in the Navy wishing to avail themselves of the splendid opportunities for advancement now afforded by our naval regulations, the I.C.S. Ocean Navigation Course is the most practical means of acquiring the knowledge of navigation required to pass the examination for ensign. This Course of study has been indorsed by many naval officers of high rank. Its thoroughness and practicability are equaled by no other work on navigation.

HOME OF THE I.C.S.

Above—The General Offices—The Great Service Department and Printery.

Below—The Administration Building—Instruction Department and Schools—Woman's Institute.



What the I.C.S. Have Done

SIX months after the enrolment of the first student by the International Correspondence Schools a thousand men were studying the first Course by mail. Additional subjects were then added from time to time until today the Schools offer instruction in over 400 Standard Courses and an indefinite number of Special and Combination Courses covering many branches of business and technical, industrial, and general education.

To conduct their work requires the brains and hands of over 1,700 employes in America alone and of hundreds in other countries of the world.

They have enrolled more than 4,000,000 persons, representing every occupation in the realm of industry and every country on the globe. Many thousands of new students are being enrolled each year. Since 1891 six times as many students have been enrolled as Harvard has enrolled in three centuries; ten times as many as Yale has taught since her doors swung open in 1701; five times as many as are in attendance today at all the colleges, universities, and technical schools in the United States.

This tremendous growth has been brought about because the I.C.S. system of teaching is designed wholly for the particular field the Schools occupy. I.C.S. textbooks constitute the foundation of this system. To teach successfully by correspondence requires an entirely different kind of textbook from that used in the classroom work. Books that need a teacher to explain and elaborate them are of little value to the student who must study at home or at his work bench or by the flare of a miner's lamp.

So I.C.S. textbooks had to be created. They take nothing for granted save the ability to read English. They begin at the beginning and proceed by easy stages, leading the student forward by natural and carefully graded steps. More money has been invested in the preparation of these textbooks than upon any other textbooks ever published. They have been written by practical men and edited by our own correspondence experts. Every subject is presented in a manner that can be readily understood by students who study at home. I.C.S. textbooks are used for reference and instruction in scores of colleges and universities, in government schools, institutes of technology and vocational schools in America, by the U. S. Navy Department in its Shipboard Training Schools, and by many of the largest industrial corporations in their training classes for apprentices and employes.

The value of I.C.S. Courses is amply proved by the thousands of enthusiastic letters on file in Scranton telling of advancement from unskilled drudgery to well-paid positions of trust and responsibility. Many write us of positions secured because of I.C.S. training, and others tell of positions held when other workers were laid off. An investigation of exactly 1,000 typical I.C.S. students who were making fair pay at the time of enrolling showed that, after receiving I.C.S. training, they were making nearly three and one-half times as much as formerly.

What I.C.S. Lessons Are Like

IMMEDIATELY on accepting a student's application for enrolment a manual is mailed telling him how to proceed with his studies so as to derive the greatest possible benefit from them. Several lesson texts and other supplies are also sent so that he may get started promptly. Additional texts are mailed as he proceeds with his studies so that he always has on hand a few unfinished lesson texts.

Through all the years since 1891 I.C.S. lesson texts have become famous for three features:

1. **They cover subjects thoroughly.**
2. **They are practical.**
3. **They are easy to understand.**

It was found many years ago that ordinary textbooks which are prepared for general reading or for class teaching are not suitable for correspondence instruction. I.C.S. texts are special texts prepared specially for the student who must study at home.

In preparing these unusual lesson texts nearly $5,000,000 has been spent, more than $2,000,000 in the last 13 years, an average of almost $154,000 a year.

The lessons of I.C.S. courses must not only be so simply written that anyone can understand and follow their instruction, but they must be absolutely accurate. Many of them are written by experienced writers employed on the I.C.S. staff. Others, including many advanced lessons on highly technical subjects, are by men prominent in the fields they cover. The concerns represented by our outside writers include: Westinghouse, General Electric, Radio Corporation of America, U. S. Bureau of Public Roads, U. S. Hydrographic Office, University of Pittsburgh, University of Pennsylvania, New York University, University of Michigan, California Institute of Technology, U. S. Navy, Pratt Institute, Canadian National Railways. But pages of printed matter alone are not enough. Illustrations have helped to make I.C.S. texts famous and there are probably no better illustrated texts in the world.

I.C.S. lesson texts in many respects are the most unusual, most unique and helpful in existence. And the fact that they are being used for reference and classroom work by more than 350 schools and colleges is an indication of the approval set upon them by the educational world.

I.C.S. Method of Instruction

BY MEANS of the I.C.S. plan, students are taught the theory and practice of trades and professions. The acquiring of such knowledge increases their earnings and puts them on a higher plane in life. To accomplish this purpose—to teach those of little or no schooling and already engaged in the occupations of life—requires a system different from any in use before 1891. In that year the I.C.S. method of teaching was introduced, by means of which men are trained by special, expert instructors, through the medium of correspondence.

The proper textbooks in pamphlet form are sent to the student as he proceeds with the Course. There are no books to buy. The pamphlets are of convenient size and may be carried in the pocket for study in spare moments in the home, the office, the shop, on the street car or train or elsewhere.

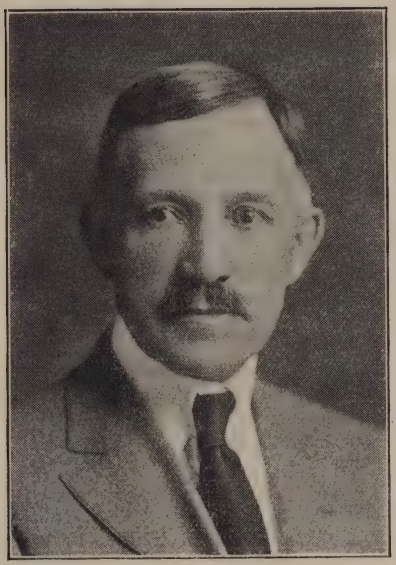
Sending Answers to Questions

As soon as a student enrolls with the I.C.S. he is sent the first lessons of his Course. He also receives a pamphlet entitled "Manual of Information for Students" in which he is told how to proceed with his Course. On their receipt he does the work required for the first lesson. He then sends his work, which may be written answers to Examination Questions or a Drawing, and immediately begins on the second lesson. When the first lesson is received by us it is examined, graded, criticized, recorded, and returned with the passing mark inscribed on it, provided the lesson merits a grade of A, B, or C. If the grade is below C, written work is returned and the student is asked for additional work until his grade is up to the standard. Drawings, in Courses that include drawing work, that do not merit a grade of C are returned with a request that they be wholly or partly redrawn.

With each completed lesson returned to a student are sent instructions for one or more additional lessons, so that he always has plenty of work on hand. Only two or three days usually are required to examine and correct a lesson, make the necessary records, and start it on its return with new lessons.

Special Instruction

If at any time a student informs us that something in his Course seems too difficult for him to master with the printed Instruction Papers only, we gladly give him special instruction. On request, and also whenever we deem it advisable, we appoint an Instructor to give special attention to his lessons and inquiries so as to give him all the help he needs. This costs the student nothing extra; it is part of our Method of Instruction. He cannot exhaust the patience of our instructors. The busier he keeps the mails, the better we like it. The length of time required to complete the Course depends upon the student, the spare time he devotes to it, the length of the Course, etc. Many students have secured splendid positions after finishing only parts of their Courses, and have then kept right on with their lessons, in this way qualifying for still better positions and higher salaries.



Captain E. K. Roden

Director,
International Correspondence
School of Navigation

Graduate, Government Nautical College, Sweden; Post-Graduate in Marine Engineering and Naval Architecture. Fifteen years' experience as a Navigator in all classes of trans-oceanic and coastwise ships. Author of I.C.S. textbooks on Ocean Navigation, Coastwise Navigation, Lake Navigation, Motorboat Navigation, Descriptive Meteorology, Practical Astronomy; also the Mariners' Handbook and many standard works, brochures, and serials including: Luxury and Safety in Ocean Travel (Translated into six languages); Life Saving Appliances at Sea; Piloting in Foggy Weather; Educational Facilities of the Navy; Ropes and Splicing. Member of the United States Naval Institute; Navy League of the United States; and other technical and scientific societies in the United States and abroad. A man eminently qualified to direct your instruction.

Ocean Navigation Course

Subjects Taught

Arithmetic
Formulas
Elements of Geometry
Elements of Navigation
Ship Drafting (For reference only)
The Compass, 2 Lessons
Chart, Lead, and Log
Piloting
Logarithms
Trigonometry
Dead Reckoning, 2 Lessons
Nautical Astronomy
Latitude
Longitude and Azimuth
Sumner's Method
Marcq St. Hilaire's Method, 2 Lessons
Ocean Meteorology
Stowage of Cargo
International Rules and Signals

THE subjcts taught in the Ocean Navigation Course are sent the student in the order given above. It will be noticed that by this arrangement the mathematical Papers are distributed among the subjects on Navigation proper so that each Paper comes directly before the one in which are applied the principles treated. The necessity of studying all mathematical subjects before taking up Navigation proper is thus eliminated. The mathematical subjects are all treated from the standpoint that the student has no education other than the ability to read and write. They contain only such matter as will be useful to the student in his subsequent studies and in his career as a practical navigator.

Easy to Learn, Remember, and Apply

The Papers on *Elements of Navigation; The Compass, Chart, Lead, and Log; Piloting;* and *Dead Reckoning,* consisting of about 300 pages in all, contain detailed explanations of all methods properly belonging to navigation by dead recokoning, beginning with definitions of latitude and longitude and gradually taking up the various methods and instruments used in fixing a ship's position at sea without the aid of astronomical observations.

The important subject of deviation and compass compensation is explained in an exhaustive treatment, illustrated with numerous cuts and colored diagrams. Special stress has been laid upon how to convert a compass course into true course, and conversely by both the old and new form of compass card; and how to allow properly for all errors affecting the course run by a ship. There is a general discussion of the Gyro-Compass and detailed information as to its construction and operation. All standard types of instruments used in the navigation of a ship are carefully explained, as is also chartwork and the construction of Mercatorial charts.

In the Paper on *Piloting* the student will find explained all principal methods employed in fixing the position of a ship when navigating in sight of land. In this Paper is included also a description of submarine signaling and Radio-Compass gearings. The different methods of sailing are explained in the two Papers called *Dead Reckoning.* Numerous solutions are given, showing how latitude and longitude are found by each method. Under the heading of Day's Work are given several cases worked out in detail, showing plainly the actual work performed in fixing a ship's position by dead reckoning. The Papers on *Nautical Astronomy* give full explanations of the principles underlying the methods on which a ship is navigated by the aid of celestial bodies. It explains the systems of coordinates of the celestial sphere and the apparent position and elements of objects used in celestial

navigation. The sextant, its errors, adjustments, and use are fully explained and profusely illustrated in this Paper, as are also the different corrections that have to be applied to an altitude measured in an artificial horizon or on the sea horizon. Careful attention has been given to the different kinds of time and the relation of one interval of time to another. The same may be said of the astronomical elements found in the Nautical Almanac and the determination of the meridian passage of celestial bodies.

In the Paper on *Latitude* will be found all standard methods of determining latitude by observation of celestial bodies. Each method is illustrated by one or more examples worked out in minute detail. *Longitude and Azimuth* explains in detail how the longitude of a ship is fixed by observing the hour angle of a celestial body and how the deviation of the compass is determined at sea by azimuth observations. In *Sumner's Method* a detailed graphic description is given of the fixing of a ship's position at sea by astronomical cross-bearings. This, perhaps, is the clearest explanation ever printed of this excellent method. The determination of the error and rate of the chronometer by astronomical observations is also treated in this Paper. In *Marcq. St. Hilaire's Method* is explained the new method of determining position lines by comparing an observed with a calculated altitude of the same body. Sights worked out by both Sumner's and the St. Hilaire Method show the value and exactness of the new method. Colored diagrams are used in this Paper to distinguish the two systems of lines and special plotting sheets are furnished the student on which to plot position lines required in the Examination Questions. All sights for latitude and longitude are worked out with the Nautical Almanac for 1930 using civil time exclusively. In these papers are given also concluding remarks on the navigation of high seas. *Ocean Meteorology* deals with the most important subjects coming under this heading. It contains information relating to weather, the use of the barometer, and the law of storms. Descriptions and charts of the principal oceanic currents are given, including wind charts, showing the prevailing wind directions for certain times of the year. The subjects of tides and tidal currents are fully treated, and considerable space is devoted to suggestions relative to the handling of vessels in heavy weather. Candidates for deck officers are expected to have a fair knowledge of how to receive, properly stow, and discharge ships' cargo. The Lesson Unit on *Stowage of Cargo* is intended to give, in condensed form, this important information to the young officer. It deals with all vital matters relating to the proper care of cargo in the hold of a ship. *International Rules and Signals* contains the revised rules for preventing collisions at sea, a thorough description of the international code system and other important signals, the United States life-saving service, and suggestions for procedure in case of accidents at sea. Also, the questions usually propounded applicants for license before the Supervising Inspectors will be found in this Paper. *Bowditch Useful Tables* are used exclusively and furnished free with the Course, making a complete Course of Instruction for the practical navigator. For synopses of subjects, see page 22.

At Sea, It's Up to the Bridge

and the Bridge Must Be READY

The modern ship is a floating business organization and training is required in every department of it. Whether in calm, or storm, or emergency the bridge must be ready.

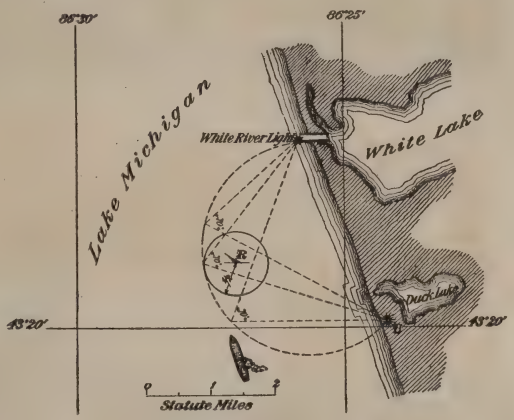
Photos by courtesy of United Fruit Lines, Hamburg-American Lines, Georgian Bay Line, and Dollar Line.

Lake Navigation Course

Subjects Taught

Arithmetic	**Elements of Geometry**
Formulas	**Lake Navigation, 5 Parts**

ARITHMETIC, Formulas, and *Elements of Geometry* contain only such matter as will enable the student to understand the mathematical principles on which navigation is founded. *Lake Navigation* first explains the principles on which the position of any point on the earth's surface is determined, followed by numerous examples showing the relation between latitude, longitude, and time. About fifty printed pages are devoted to the compass, its errors and adjustments, besides describing the methods of determining and tabulating any error the compass may have after being compensated. Special attention is given to the subject of course corrections, and the diagrams accompanying each problem on this subject will be found of great value in avoiding errors in applying corrections for leeway, variation and deviation. All the methods of practical utility in coast navigation are explained, including the use of vertical and horizontal danger angles. The methods for fixing a ship's position at sea by keeping accounts of courses and distances run are carefully considered. Determining the error of the compass by means of observations of the sun is next taken up. Amplitude tables and a variation chart, expressly prepared for the Great Lakes, accompany this subject, and matters relating to time, declination, azimuth, amplitudes, and the use of the pelorus are here fully explained and illustrated by examples. Notes relating to the propulsion of vessels, with explanation of the pitch and slip of the propeller, speed problems, and notes on coal consumption, will be found of much practical value. Then follows a thorough treatment on the causes of storms and the barometric changes attending them, with suggestions relating to the handling of steamers in heavy weather. Storm Signals and Pilot Rules, with a large amount of practical information, complete the Course.



HORIZONTAL DANGER ANGLE

Specimen Illustration (Reduced) From "Lake Navigation, Part 2"

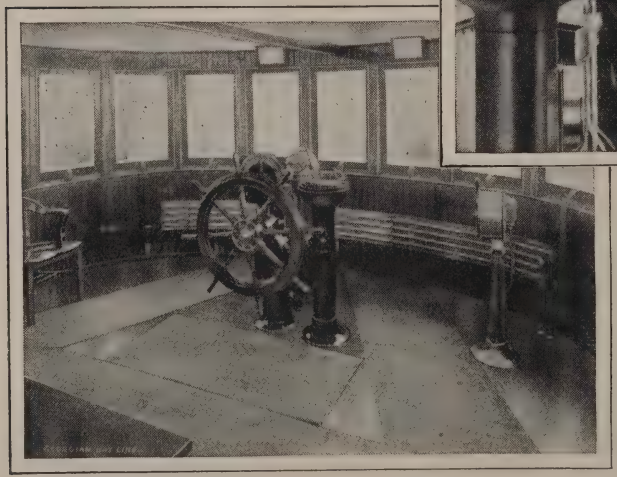
The Lake Navigation Course consists of nine Instruction Texts, which cover over 600 pages. For synopses of subjects of this Course, see page 31.

It Takes Trained Men to Direct the Movement of Ships

Top—Operating and keeping in operation the power plant of a modern liner requires knowledge that is exact. The engine room and the bridge must often act in unison and at a moment's notice.

At the control board of the Acadia—Eastern Steamship Lines.

Right—Gyro-compass repeater taking bearing of a point of land.



Left—The most picturesque symbol of the sea. Today, many delicate and complex instruments aid the navigator and pilot, but they must be understood.

Motor-Boat Navigation

THE I.C.S. Course in Motor-Boat Navigation will teach the student how to operate the motor-boat engine and how to navigate the boat to the best advantage. The Course instructs in how to locate and remedy any kind of motor troubles liable to occur. And it teaches the best methods of cruising on any lake or river, and along the coast lines of the United States.

In short, the Motor-Boat Running Course will enlighten the student on all the important matters he needs to know for the successful operation and navigation of a motor boat, in all possible times, places, and conditions.

The instruction text on navigation comprehends all of the approved methods for the coastwise cruising of motor boats.

From a motor-boat point of view the compass and its errors are fully covered. Methods of determining the location of a vessel by the use of soundings plotted on charts are carefully gone into. This instruction will enable the student to navigate his boat in fog or darkness.

The student is taught how to fix the boat's position from visible objects; how charts are used to determine the course to steer from point to point; how to measure the distance run; how to determine the bearings of objects passed along the coast; how to use the lead to advantage; how to make allowances for currents; and many other facts of first importance to the motor-boat owner and operator.

This Course will not make the student a deep-sea navigator, a designer of motors or engines, or a naval architect. Students that want to go further into the subject of Navigation should enroll for the I.C.S. Course in Ocean Navigation.

Opportunities for Motor-Boat Operators

Motor-boat owners themselves should take this Course, even if they employ the services of an expert operator. A knowledge of the principles taught here will enable the owner to save much expense, to avoid accidents and petty annoyances—and to get the greatest joy from his boat.

The gas engine section of the Course teaches the student how to get the most power from his engine with the least expense. It teaches how to locate and remedy troubles.

Those having to do with motor boating for commercial purposes will find a study of this Course to be very profitable. Commercial motor craft are now found wherever there is suitable environment. In the halibut and salmon fisheries the motor boat has replaced the sail boat.

Subjects Taught

Nautical Terms
Motor Boats, 2 Parts
Marine Gasoline Engines, 2 Parts
Management of Marine Gasoline Engines, 2 Parts
Motor-Boat Navigation, 2 Parts
Motor-Boat Rules and Signals

Ocean Navigation Course

Synopses of Subjects

Arithmetic

Elements of Arithmetic
Fractions
Decimals
Weights and Measures
Ratio and Proportion
Powers and Roots

Formulas

56 Pages

This Paper treats of the use and application of symbols, the processes usually performed with equations, transformation of quantities and the simple algebraic processes used in solving formulas. The object of this Paper is to familiarize the student with the application of formulas.

ELEMENTARY OPERATIONS. Use of Symbols: Rules and Formulas Compared; Arithmetical Signs and Their Application. **Equations Formed With Numbers:** Fundamental Principles. **Equations Formed With Symbols:** Application of Symbols; Operations With the Terms of an Equation; Parenthesis; Equations With One Unknown Term.

APPLICATION OF FORMULAS. Solutions of Simple Standard Formulas: Transformation of Formulas.

Elements of Geometry

26 Pages, 69 Illustrations

GEOMETRY: Lines and Angles; Plane Figures; The Triangle; The Circle; The Quadrilateral.

MENSURATION: Mensuration of Plane Surfaces; The Triangle; The Quadrilateral; The Circle; Examples; Mensuration of Solids; The Prism and Cylinder; The Sphere; Examples.

GEOMETRICAL CONSTRUCTION: Solution of Useful Problems in Geometrical Drawing.

TRIGONOMETRIC TERMS: Explanation of the Trigonometric Functions; Ratios of the Trigonometric Functions; Trigonometric Tables Discussed.

Elements of Navigation

47 Pages, 23 Illustrations

DEFINITIONS AND PRINCIPLES: Divisions of the Science; Navigation by Account and Nautical Astronomy Defined; Terrestrial Sphere; Axis of the Earth; Poles of the Earth; Equator; Meridians; Parallels of Latitude; Form and Magnitude of the Earth; Rotundity of the Earth; Latitude Defined; Difference of Latitude Defined; To Find the Difference of Latitude Between Two Places; Examples; Colatitude; Nautical Mile; Statute Mile; Longitude Defined; Difference of Longitude Defined; To Find the Difference of Longitude Between Two Places; Determination of a Position on the Earth's surface; Examples; Relation Between Time and Longitude; Conversions of Time to Angular Measure and Vice Versa; Sea Horizon; Its Distance of Visibility for Different Heights of the Observer's Eye; Course; Rhumb Line; Bearing of an Object; Distance; Departure Explained.

NAUTICAL TERMS EXPLAINED AND DEFINED: Bow; Stern; Midship; Fore-Aft Line; Port; Starboard; Athwartship; Abeam or Abreast; Ahead; Dead Ahead; Head Wind; Astern; Relative Bearings and How Named; Windward; Leeward; Close-Hauled; Tack; Working to Windward; Adrift; Aground; Aloft; Ballast; Division of Time on Shipboard; Watches; Currents; Tides; Spring and Neap Tides; Priming and Lagging; Slack Water; Set and Drift of a Tide; Range of a Tide; Age of a Tide; Sternboard; Sternway; Lie-to or Heave-to; Under Way; Under Weight; Wake; Taffrail; Types of Rigging; Fore-and-Aft Rigged Vessels; Square-Rigged Vessels; Ship; Brig; Bark; Barkentine, Brigantine; Schooner; Topsail Schooner; Names of Masts; Names of Sails and Fittings.

COMPASS TERMS: Definitions Relating to Magnetism; Compass Card; Lubber Line; Table Showing the Names of Points and the Number of Degrees, Minutes, and Seconds, Corresponding to Any Number of Points and Fraction Thereof; Compass Binnacle; Types of Magnetic Compasses and Their Use; Lord Kelvin's Compass; The Ritchie Compass; The Pole Compass; Magnetism; Natural Magnets; Artificial Magnets; Magnetic Poles; Law of Magnetic Attraction and Repulsion; Magnetic Property of the Earth.

The Compass (Part 1)

28 Pages, 12 Illustrations

ERRORS OF THE MAGNETIC COMPASS: Magnetic Meridian; Variation or Magnetic Declination; Agonic and Isogonic Lines; Changes in Variation; Magnetic Dip; Isoclinic and Isodynamic Lines; Deviation; Induced Magnetism; Magnetism by Induction From the Earth; Transient Magnetism; How a Ship is Magnetized; Subpermanent Magnetism; Vertical and Horizontal Iron; Semicircular Deviation; Quadrantal Deviation; Total Error of the Compass.

MAGNETIC COMPASS COMPENSATION: General Principles; Classification of Errors; Compensating Binnacles; Compensating the Quadrantal Deviation; Compensating the Semicircular Deviation; Heeling Error; Summary of Compensation.

GYRO COMPASS: General Discussion; Principles of Operation; Utilization of Gravity; Mercury Ballistic; Sperry Gyro Compass; Speed and Latitude Corrections; Master Compass and Repeaters; Starting the Gyro Compass; Care and Operation; Points of Advantage; Practical Suggestions for the Care and Operation of the Gyro Compass.

The Compass (Part 2)

28 Pages, 12 Illustrations

FINDING AND TABULATING THE DEVIATION: Preliminary Precautions; Finding the Magnetic Bearing; Swinging the Ship; Compass Card Equivalent; Naming the Deviation; Reciprocal Bearings; Deviation Tables; Deviation Diagrams; Napier's Deviation Diagram; Use of Napier's Diagram; Remarks on Deviation Tables; Proper Placing of Compass; Deviation Ranges.

CORRECTION OF COURSES: Methods and Rules; Classification of Courses; True Course; Magnetic Course; Compass Course; Leeway; Applying Corrections to Each Form of Card; Cautionary Remarks; Finding Courses With New Form of Compass Card; Finding Courses With Old Form of Compass Card; Finding Variation and Deviation; Application of Rules; Finding Compass Course From True Course; Finding True Course From Compass Course; Finding True Bearing From Compass Bearing.

Chart, Lead, and Log

45 Pages, 25 Illustrations

CHARTS AND CHART WORK: Charts; Principles of Construction; The Polyconic Chart; The Mercatorial Chart; Wright's Graphic Explanation of the Mercatorial Chart; Meridional Parts; How Found for Any Latitude; Meridional Difference of

Latitude; How It Is Found; Classification of Charts; General Charts; Sailing Charts, and General Charts of the Coast; Plans, or Special Charts; Coast, or Harbor Charts; Conventional Signs and Symbols Used on Charts; Correction of Charts; Notice to Mariners; Pilot Charts; Instruments Used in Chart Work; The Parallel Ruler; The Dividers; The Course Protractor; How to Plot a Position on the Chart; How to Find the Latitude and Longitude of Any Place or Position From the Chart; How to Find the Distance Between Any Two Points on the Chart; To Find the Course or Bearing Between Any Two Points on the Chart; How to Construct a Mercator's Chart; Explanation and Graphic Description of Method.

LEAD AND LOG: The Lead; General Description; Hand Lead; Coasting Lead; Deep-Sea Lead; Markings of the Lead Line; Methods of Sounding; The Sounding Machine; Description of Lord Kelvin's Sounding Machine; Mechanism of the Sounding Machine; Directions for Operating the Sounding Machine; Importance of Using the Lead; Reduction of Sounding to Mean Low-Water Level to Agree With the Soundings Recorded on Charts; The Sonic Depth Finder; The Log; Common Chip-Log; The Principle on Which Its Operation is Based; Log Chip; Log Line; Log Glass; Relation Between a Knot and a Nautical Mile; Method of Heaving the Log; Errors of the Common Log; Correction of These Errors; Examples; Formulas for Finding Correct Distance When Glass, or Knot, or Both Are in Error; Patent Logs; Harpoon Log; Taffrail Log; Their Peculiarities, and Pointers Regarding Their Care and Use.

Piloting

43 Pages, 32 Illustrations

DETERMINING THE POSITION OF A SHIP WHEN IN SIGHT OF LAND: By Means of a Single Bearing and Estimated Distance; By Cross-Bearings; By Means of Bow and Beam Bearings or "Four-Point" Bearing; By Means of Two Bearings of the Same Object; Graphic Solution; Solution by Table; Illustrative Example; To Find the Distance of a Ship From the Base of a Mountain Peak or Lighthouse of Known Height; Cautionary Remarks; To Find the Distance of a Ship From a Fixed Object Seen on the Sea Horizon; Examples.

PILOTING IN FOGGY WEATHER: To Find the Position of a Ship in Foggy Weather by Means of a Line of Soundings; Explanation and Graphic Illustration of a Practical Case; Utilization of Sounding Curves; Radio Compass Bearings; Verifying the Ship's Position by Radio Compass Bearings When Approaching the Coast; Limitations of Radio Bearings. Submarine Signaling; Description; Sound-producing Apparatus; Sound-Receiving Apparatus; Transmitters; Direction Indicator; To Find Direction by Sounding Bell; General Remarks on System.

RANGE LINES AND DANGER BEARINGS: Range Lines; Danger Angles; The Vertical Danger Angle; Precautions When Observing; The Horizontal Danger Angle; Illustration; Comparison of Vertical and Horizontal Danger Angles; Danger Bearings; The Station Pointer; Its Description and How Used; The Position Finder; Its Description and Use; The Sextant; Angular Distance; Method of Reading the Sextant; Index Error; Measuring Horizontal Angles.

Logarithms

51 Pages

Logarithms are used to simplify multiplication, division, the formation of powers, and the extraction of roots. The importance of this subject may be inferred from the statement of a French astronomer—that the invention of logarithms was equivalent to doubling the life of the calculator.

TABLE OF COMMON LOGARITHMS. TABLE OF USEFUL NUMBERS: Exponents; To Find the Logarithm of a Number; To Find a Number Whose Logarithm is Given; Multiplication by Logarithms; Division by Logarithms; Involution and Evolution by Logarithms. **Practical Application of Logarithms.**

Trigonometry

59 Pages, 58 Illustrations

PLANE TRIGONOMETRY: Angular Measure; Trigonometric Functions; Functions Represented by Lines; Relations of Functions; How to Use Tables of Logarithmic Functions; The Arithmetical Complement. The Solution of Plane Triangles; Right Triangles; Oblique Triangles.

SPHERICAL TRIGONOMETRY: Definitions; Properties of the Sphere; Position of a Point on the Sphere; Signs of Trigonometric Functions; Solutions of Spherical Triangles; Formulas for Right Triangles; Napier's Rules; Oblique Spherical Triangles; Derivation of Formulas.

Dead Reckoning (Part 1)

47 Pages, 30 Illustrations

DETERMINING THE POSITION OF A SHIP BY COURSES AND DISTANCE RUN: Introductory Remarks; Plane Sailing; Formulas Relating to Plane Sailing; The Use of Traverse Tables; Graphic Representation of Cases; Traverse Sailing; Explanation of Method; Constructing a Traverse; Illustration; Graphic Solution; Cautionary Remarks; Courses Should be True; Parallel Sailing; Explanation; Relation Between Latitude, Departure, and Difference of Longitude; Use of Traverse Tables in Parallel Sailing; Middle Latitude Sailing; Explanation; Application of Traverse Tables; Derivation of Formulas; How to Find the Middle Latitude; Classification of Cases; Correction of the Middle Latitude; Table Containing Corrections for Middle Latitude; Efficiency of the Middle-Latitude Method; Mercator's Sailing; Principles Explained; To Find the Meridional Difference of Latitude; Solution of Cases by Traverse Tables; Solution of Cases by Inspection; Remarks on the Middle Latitude and The Mercator Method.

Dead Reckoning (Part 2)

56 Pages, 19 Illustrations

CURRENT SAILING: Methods of Determining the Set, Drift, and Effect of Currents; Set and Drift Currents; Motion and Rest; Path or Track; Velocity; Representation of Motion; Laws of Motion; Composition of Motions; Parallelogram of Motion; Solution of Problems in Current Sailing; Determination of Current by Difference of Noon Positions; Allowance for Tidal Streams; To Find the Set and Drift of a Current by Bearings.

THE DAY'S WORK: Day's Work by Dead Reckoning; Data Required in Day's Work; The Scrap Log; Logbook Account; Order of Procedure; Illustration of Method; Taking the Departure; Point of Departure; The Departure Course; Practical Cases Showing Method of Calculation; Introduction of Current in the Day's Work; Numerous Cases Worked Out in Detail.

GREAT-CIRCLE SAILING: Introduction; Advantage of Great-Circle Sailing in Saving of Time and Reduction of Distance; Advantage of Method to Sailing Ships; Townson's Rule; The Great-Circle Track; Representation of Track on a Mercator's Chart; Definitions Relating to Great-Circle Sailing; The Point of Maximum Separation; To Determine a Great-Circle Track; To Find the Initial and the Final Course; To Find the Distance; To Find the Vertex; To Find the Point of Maximum Separation; To Find the Point of Intersection of the Great-Circle Track With the Equator and the Course to be Steered There; Order of Procedure; Determination of Courses to be Steered; Azimuth Tables as Check on Courses; Illustrative Examples, Graphical Methods Relating to Great-Circle Sailing; Great-Circle Charts;

Relation Between Latitude and Radius of Parallel; Airy's Method; Table for Finding the "Corresponding Parallel" According to Airy's Method; Towson's Method; Composite Sailing.

Nautical Astronomy (Part 1)

74 Pages, 41 Illustrations

RUDIMENTS OF ASTRONOMY: Definitions and Principles; Divisions of the Science; The Celestial Sphere; Angular Distance; Angular Magnitude; Relation Between Distance and Apparent Size; Center of the Celestial Sphere; Celestial Poles; The Celestial Equator; The Zenith; Rational Horizon; The Ecliptic; Systems of the Celestial Sphere; Determination of a Point of the Celestial Sphere; Classification of Systems; The Horizon System; Verticals; Celestial Meridians; Prime Vertical; True Altitude; Zenith Distance; Azimuth; True Amplitude; The Equinoctial System; The Equinoctial; Diurnal Motion; The Hour Angle; Equinoxes; Solstices; The Equinoctial and Solstitial Colures; Right Ascension; Declination; Polar Distance; Parallels of Declination; The Ecliptic System; Obliquity of the Ecliptic; Celestial Latitude and Longitude; Comparison of the Three Systems.

SOLAR SYSTEM AND THE UNIVERSE: The Solar System; Planets; Orbits; Radius Vector; Periodic Times; Inferior and Superior Planets; Movements of Planets; Kepler's Laws; Eccentricity; Aphelion; Perihelion; Line of Apsides; Movement of Planets; Conjunction; Opposition; Elongation; Quadrature; Apparent Motion; Retrograde Motion; Sidereal and Synodic Period; Elements of Solar System; The Earth; Motion of the Earth; The Seasons; Velocity of Rotation; Precession and Nutation; The Nutation; The Moon; Phases of the Moon; Eclipses of the Moon and Sun; The Stars; Constellations; The Zodiac; Signs of the Zodiac; Classification of Stars; The Light Year; Annual Parallax; How to Locate the Principal Stars; Position of the Vernal Equinox in the Sky; Utilization of Planets in Navigation.

THE SEXTANT: Its Construction and Use; Law of Reflected Rays; Description of the Sextant; Theory of Construction; Graduation of the Sextant; Rule for Reading the Sextant; The Vernier and Fineness of Reading; Illustrative Examples; Reading Off the Arc; To Adjust the Sextant; To Adjust the Index Glass; To Adjust the Horizon Glass; To Adjust the Telescope; The Index Error; To Find the Index Error by Means of the Sun; To Find the Index Error by the Sea Horizon; Removal of Index Error; Serial Readings; How to Use the Sextant; The Quadrant; The Circle of Reflection; Correction of Altitudes; Sensible or True Horizon; Dip of the Horizon; To Find Amount of Dip; Refraction; Parallax; Parallax in Altitude; Horizontal Parallax; Parallax of the Moon; Semi-Diameter; Where Semi-Diameters Are Recorded; Examples Showing Corrections Applied; Symbols and Abbreviations; The Artificial Horizon; How to Measure Altitudes in an Artificial Horizon; Correction of Double Altitudes.

Nautical Astronomy (Part 2)

53 Pages, 6 Illustrations

TIME: Measurement of Time; Culmination or Transit; Classification of Time; Sidereal Time; Apparent Solar Time; Relation Between Sidereal and Apparent Time; Mean Solar Time; Disadvantage of Sidereal Time; The Mean Sun; Civil Time; Civil Day; Equation of Time; Astronomical Day; To Convert Civil Into Astronomical Time and Vice Versa; Local Civil Time; Standard Time; To Convert Standard Into Local Civil Time; The Calendar; The Civil Year; Tropical Year; Sidereal Year; Old Style and New Style; The Chronometer; Explanation of the Important Functions of the Chronometer; Characteristic Features of the Chronometer; How to Wind a Chronometer; Placing a Chronometer; Transportation of Chronometers; Cleaning; Rating the Chronometer; Application of Error and Daily Rate; To Find the Daily Rate; Comparison of Chronometers; Method of Comparison.

THE NAUTICAL ALMANAC: The Explanation of Its Contents and Use; The Greenwich Date; How to Correct Elements Found in the Nautical Almanac; To Find

the Sun's Declination; To Find the Equation of Time; To Find the Sun's Semi-Diameter; To Find the Right Ascension of the Mean Sun; To Find the Moon's Declination and Right Ascension for Any Date; To Find the Moon's Semi-Diameter and Horizontal Parallax for Any Date; To Find a Planet's Declination and Right Ascension; To Find the Right Ascension and Declination of a Fixed Star; To Find the Local Time of the Moon's Meridian Passage in Any Longitude; To Find the Time of a Planet's Meridian Passage in Any Longitude.

PROBLEMS RELATING TO TIME: To Convert Mean Into Apparent Time and Apparent Into Mean Time; To Find the Sidereal Time Corresponding to a Certain Mean Time; To Find the Civil Time Corresponding to a Given Sidereal Time; To Find What Bright Star Will Be on the Meridian at a Certain Civil or Apparent Time; Remarks on Tables II and III of the Nautical Almanac; To Find What Bright Star Will Be on the Meridian Between Two Given Times; To Find the Time When a Certain Star Will Be on the Meridian; To Find Approximately the Apparent Time of a Star's Meridian Passage; Cautionary Remarks; Abridgment of Nautical Almanac for the Year 1930.

Latitude

50 Pages, 7 Illustrations

DETERMINATION OF LATITUDE: Meridian Altitude; Desirable Objects for Latitude Observations; Elements Involved; Altitude; Zenith Distance; Declination; General Formula for Latitude; Meridian Altitudes at Lower Transit; Circumpolar Stars; Latitude by a Meridian Altitude of the Sun; Directions for Observing; Application of Corrections; The Use of Constants and Their Effect on Latitude; Latitude by a Meridian Altitude of a Star; Directions for Observing; Visibility of Stars; To Calculate the Approximate Altitude in Advance; Latitude by a Meridian Altitude of a Planet; Directions for Observing; Latitude by a Meridian Altitude of the Moon; Directions for Observing; Cautionary Remarks; Latitude by a Meridian Altitude Below the Pole; Explanations; Measuring the Altitude at Lower Transit; Directions for Observing; Latitude by Reduction to the Meridian; First Method; Application of Method to Stars and Planets; Second Method; Explanation; Limitation of Method; Application of Method to Stars and Planets; Cautionary Remarks; Latitude by Change of Altitude Near the Prime Vertical. Latitude by the Pole Star; Simplification of Method; Present and Future Pole Stars; Compound Altitudes; The Hack Chronometer.

Longitude and Azimuth

60 Pages, 25 Illustrations

DETERMINATION OF LONGITUDE: Longitude by Chronometer; Time Sight of the Sun; Derivation of Formula for Hour Angle; When Hour Angles Should be Observed; Directions for Finding Longitude; Illustrative Examples; Comparison of Apparent Times; The Use of Proportional Parts; Correction for Run; Longitude by Star Observations; Time Sight of a Star; Directions; Application of Method to Moon and Planets; Time Sight of a Planet; Longitude by Sunrise and Sunset Sights; Explanations and Directions; Cautionary Remarks.

AZIMUTH DETERMINATIONS: Finding the Compass Error at Sea; Preliminary Remarks; Amplitude Observations; Explanation of Amplitude Tables; Formula for Computing Amplitude; Correction of Observed Amplitudes; Directions for Observing; Amplitude Diagrams; True Amplitude by Inspection; Remarks on Amplitudes; To Find Time of Sunrise and Sunset; The Altitude-Azimuth Method; The Altitude-Azimuth Formula; Directions for Observing; Simultaneous Observation for Azimuth and Hour Angle; The Time-Azimuth Method; Directions for Observing; Explanation of Azimuth Tables; Azimuth Tables; The Use of Azimuth Tables; Azimuth Instruments; The Pelorus; Use of Pelorus in Heading Ship in Any Magnetic Direction; Use of Pelorus in Finding Magnetic Course of Ship; To Find True Course by Pelorus; To Find Deviation by Polaris; Swinging the Ship at Sea; To Find Deviation at Sea in Calm, Foggy Weather.

Sumner's Method

56 Pages, 25 Illustrations

ESTABLISHMENT OF LINES OF POSITION: Principles Involved; Circles of Equal Altitudes; Circle of Illumination; Lines of Position or Sumner Lines; Important Conclusions Derived From the Sumner Line; How to Obtain a Sumner Line; Graphic Representation; Plotting a Noon Position; Intersecting Sumner Lines; Angle of Intersection; Simultaneous Observations; Effect of an Error of the Chronometer on the Sumner Line; Effect of an Error in the Altitude on the Sumner Line; Methods of Calculating Sumner Lines; Illustrative Examples Worked Out in Detail; Graphical Examples Showing Application of Sumner's Method; Remarks on Sumner's Method; Allowance for Variation and Deviation; Plotting of Sumner Lines; Origin of Method; Johnson's Method; Double Chronometer Method or Rule for Finding Latitude and Longitude by Two Chronometer Observations; Explanation of Method; Illustrative Examples; Remarks on Johnson's Method.

CHRONOMETER ERRORS BY ASTRONOMICAL OBSERVATIONS: Simple Methods of Determining by Observations the Error and Rate of the Chronometer; First Considerations; Time Signals; Telegraphic Time Signals; Radio Time Signals; To Find the Error and Rate of the Chronometer by a Single Altitude of the Sun; To Find the Error and Rate of the Chronometer of Equal Altitudes of a Star; Simplification of Method; To Find Longitude by Equal Altitudes Taken Near the Meridian; Directions for Observing; Remarks on Method; Comments on Longitude by Lunar Dstances; Crossing the 180th Meridian East or West.

Marcq St. Hilaire's Method (Part 1)

55 Pages, 26 Illustrations, 3 Plotting Sheets

DETERMINING LINES OF POSITION: The New Navigation; The Comparison of Altitudes; Theory of St. Hilaire's Method; The Sine-Cosine Formula; The Cosine Haversine Formula; The Altitude-Difference; Value of St. Hilaire's Method; Combination Sights of Sumner's and the St. Hilaire Method; Plotting of St. Hilaire Lines; Use of Plotting Sheets; Locating Second Plotting Point; Observation Near Meridian; Application of St. Hilaire's Method to Stars; De Aquino's Tables; Line of Position Tables.

Marcq St. Hilaire's Method (Part 2)

42 Pages, 14 Illustrations

FINAL POSITION BY COMPUTATION: Plotting Versus Calculating the Final Fix; Formulas for Computing the Point of Intersection; Derivation of Formulas; Both Intercepts Positive but in Different Quadrants; Intercepts Positive and in Same Quadrant; One Intercept Positive and One Negative, and in Same Quadrant; One Intercept Positive and One Negative, but in Different Quadrants; Both Intercepts Negative; One Intercept Along Cardinal Point; Use of Diagrams; Treatment of Run Between Sights; Advance Calculation of Second Altitude.

CAUTIONARY REMARKS OF NAVIGATION: Trustworthy Charts; Departure Fix; Shaping Compass Courses; Dependence on Dead Reckoning; Watchfulness Over the Compass; Navigator's Routine Work; Observation of Stars; Identification of Stars Essential; Importance of Dependable Chronometers; Discrepancies in Sights; Refinement in the Working of Sights.

Ocean Meteorology

66 Pages, 18 Illustrations

WIND AND WEATHER: The Atmosphere; Meteorology and the Nautical Profession; Extent of the Atmosphere; Heat; Temperature; The Thermometer; Explanation of Principles; Thermometer Graduations; To Convert the Reading of One Ther-

mometer Into That of Another; The Barometer; The Mercurial Barometer; How to Read a Mercurial Barometer; The Aneroid Barometer; The Meaning of Barometric Changes; Winds; Force of Wind; Beaufort's Scale; Classification of Winds; Constant Winds; Trade Winds; The Doldrums; Horse Latitudes; Regions of Westerly Winds; Periodical Winds; Monsoons; Wind and Pilot Charts; Land and Sea Breezes; Variable Winds; The Simoon and Sirocco; The Puna; The Pamero; The Bora; The Nortes; Revolving Storms; Characteristic Features of a Cyclone; Rotary Motion; Progressive Motion; Shape, Diameter, and Barometric Pressure; Direction of Winds; Cyclone-Infested Regions; Cyclone Seasons; Dangerous and Navigable Semicircles; Suggestions for the Handling of Ships in or Near Cyclones; Hurricane Signs; To Find Bearing of Storm Center; To Determine Position of Ship in Relation to Storm Track; To Find Whether Center is Approaching or Receding; Brief Rules for Action to Avoid Center; The Storm Center; The Typhoon; Remarks; Notes on Weather; Weather Indications by a Mercurial Barometer; Indications by Appearance of Sky; Indications by an Aneroid Barometer; Meteorological Observations at Sea; Information for Observers.

OCEAN CURRENTS: Classification of Currents; Drift Currents; Stream Currents; Currents of the Atlantic Ocean; The Gulf Stream; Color; Temperature; Velocity; The Arctic, or Labrador, Current; The Guinea Current; The Equatorial Current; The Brazilian Current; Currents of the Pacific Ocean; Equatorial Currents; The Kuro-Shiwo, or Japan Stream; The North Pacific Drift Current; The Arctic Current; The Australian Ocean Current; Currents of the Indian Ocean.

TIDES AND TIDAL CURRENTS: Introduction; Cause of the Tides; The Lunitidal Interval; The Plane of Reference; The Diurnal Inequality; Effect of Atmospheric Pressure on the Tides; Effect of Winds on the Tide; Tidal Streams; Tide Tables and Charts; To Compute the Time of High Water; Eldridge's Illustration of Peculiar Tidal Actions; Notes Relating to the Handling of Steamers in Heavy Weather; To Lie-To a Steamer in a Gale; The Use of Oil in Stormy Weather; The Drag or Sea Anchor; Use of Sea Anchors in Coaling Ships at Sea; Jury or Temporary Rudder.

Stowage of Cargo

34 Pages, 6 Illustrations

HANDLING OF SHIP CARGOES: Stowage Factor; Stowage Principles; Shipowner's Responsibility; Use of Side Ports; Conveyors and Deck Hatches; Ship's Tackle; Cargo Masts on Pier; Electric Winches on Pier; Wharf Cranes; Floating Cranes; Bulk Freight; Dunnage; Shifting Boards; Stowing Freight in Hold; Stowing of Barrels and Casks; Handling of Barrels and Sacks; Case and Container Handling; Filling Broken Stowage Spaces.

STABILITY MAINTENANCE: Importance of Proper Distribution of Cargo; Trim of Ship; Fore-and-Aft Strains; List of Vessel; Shifting of Cargo; Stowage Suggestions; Preparations for Loading.

STOWAGE OF DIFFERENT COMMODITIES: Asphalt, Coal, Cotton, Fruits, Grain; Jute; Lumber; Live Stock; Oil in Cases; Railway Material; Sugar; General Cargo; Pilfering; Vermin.

DANGEROUS CARGO: Steamboat Inspection Service Rules; Load-Line Marks.

International Rules and Signals

59 Pages, 12 Illustrations

INTERNATIONAL CODE OF SIGNALS: History of the Code; 1934 Code of Signals; Visual and Sound Signaling; Two-Flag Signals; Three-Flag Signals; Four-Flag Signals; Semaphore Alphabet; Illustrations of Hoists; Morse Signaling; Blinker Signaling; Signaling by Sound; Position and Duration of Signals; Selected Signals; Radio Signaling; Radio Broadcasts; Weather Bureau; U. S. Coast Guard Stations; Distress Signals; Storm Signals; Hurricane Warning; Signals for Pilot.

INTERNATIONAL RULES TO PREVENT COLLISIONS AT SEA: Rules of the Road; Duty to Stay by After Collision; The Life-Saving Service; Rescue With the Life or Surf Boat; Rescue With the Breeches Buoy or Life Car; Life-Saving Signals; Recapitulation; United States Buoyage System; Colors, Shapes, and Numbers of Buoys; Caution Regarding Buoys.

TERMS AND SUGGESTIONS RELATING TO NAUTICO-LEGAL AFFAIRS: Ship's Business; Certificate of Registry; Charter Party; Manifest; Bill of Lading; Protest; Bottomry; Bill of Health; Articles; General Average; Particular Average; Petty Average; Freight or Freight Money; Lay Days; Demurrage; Jettison; Entering; Clearance; Barratry; Suggestions to Officers of Vessels in Cases of Maritime Disasters; The Cargo; Sale of Vessels; Stranded Vessels; Salvage; Port Wardens; Voyage Broken Up; Intelligence of Disasters; Danger From Fire; Abandonment at Sea; Underwriters' Agents; Stowage and Survey of Cargo; Guide to Applicants for Masters' and Officers' License; The Hydrometer; Specific Gravity; To Find Sea Draft When Harbor Draft is Known and the Reverse; The Ship's Log Book.

Bowditch Useful Tables

446 Pages

The full title of this book is *"Useful Tables From the American Practical Navigator."* Originally by Nathaniel Bowditch. Re-edited, published and sold by the United States Hydrographic Office. It includes forms for working dead reckoning and various astronomical sights, with notes explaining their application. These are followed by the tables that comprise Part 2 of the American Practical Navigator, these being the mathematical, astronomical, and nautical tables that are used by all navigators.

Nautical Almanac, 1930, Abridged

45 Pages

This book furnishes data for use in the Ocean Navigation Course in connection with the lessons involving elements of time and astronomical coordinates.

Ship Drafting

54 Pages, 34 Illustrations

INTRODUCTORY EXPLANATIONS: Definitions; Displacement; Shipbuilder's Terms; Coefficients; Types of Ships; Ships Classed According to Framing and Decks; Tonnage; Passenger and Freight Steamer for Panama Canal Traffic; Freight Steamer for General Ocean Traffic; Oil-Carrying, or Tank, Steamer; Principal Dimensions of a Ship; Drawing Plates; Lines; Beam Cambers; Structural Details; Plates; Plate Joints; Straps, Laps, and Rivets; Shapes and Angles; Channels; Marks and Numbers on Parts; Water-Tight Joints; Frames; Abbreviations Used in Drawings.

Lake Navigation Course

Synopses of Subjects

Lake Navigation (Part 1)

DEFINITIONS AND PRINCIPLES: Divisions of the Science; Navigation Defined; The Terrestrial Sphere; Form and Magnitude; Definition Relating to the Earth; The Axis and Poles of the Earth; The Equator; The Meridians; Latitude; Parallels of Latitude; The Difference of Latitude; The Colatitude; The Nautical and Statute Mile; Longitude; The Difference of Longitude; Conversions of Time and Angular Measure; Relation Between Time and Longitude; The Rhumb Line; The Course Made Good; The Distance; The Departure; Bearings; Cross-Bearings; The Sea Horizon; Determination of a Position on the Earth.

THE COMPASS: Errors and Adjustments; General Description of the Compass; Division of the Compass Card; The Compass Bowl; The Lubber's Point; The Binnacle; Lord Kelvin's Compass; Requirements of a Perfect Compass; Care of Compasses; The Steering Compass; The Standard Compass; The Pole Compass; The Azimuth Circle; The Liquid Compass; The Pelorus; Variation; Deviation; Magnetic Dip; Magnetism; Natural and Artificial Magnets; Magnetism by Induction; Polarity; Law of Magnetic Attraction and Repulsion; Magnetic Properties of the Earth; The Magnetic Meridian; Variation; How Variation Is Named; Lines of No Variation; Magnetic Variation on the Great Lakes; Magnetic Dip; Deviation; Soft and Hard Iron; Magnetic Property of Iron and Steel Vessels; The Semicircular Deviation; The Quadrantal Deviation; Compensation of Compasses; General Principles; Methods of Compensation; Classification of Errors; Compensating the Semicircular Deviation; Compensating Binnacles; Compensating the Quadrantal Deviation; The Flinders Bar; The Heeling Error; The Clinometer; Concluding Remarks.

Lake Navigation (Part 2)

DETERMINING AND TABULATING THE DEVIATION: Swinging the Ship; First Method; To Name the Deviation; Second Method; Correction of Bearings; Third Method; Limitation of the Deviation Table; Deviation Diagrams; Illustration of Use of Diagram; Proper Placing of the Compass; To Protect Compasses From Electrical Disturbances; Cautionary Remarks; Correction of Courses; The Compass Course; The Magnetic Course; The True Course; Leeway; Use of Diagrams; Rule to Find the True Course From the Compass Course; Rule to Find the Compass Course When the True Course Is Known; Numerous Examples Worked Out in Detail; Importance of Course Corrections.

MEASUREMENTS OF SPEED AND DEPTH: The Log; Principles of the Log, The Log Chip; The Log Line; The Log Glass; Relation Between the Knot and the Nautical Mile; Method of Heaving the Log; Errors of the Chip Log; Correction of Errors; Patent Logs; The Statute and the Nautical Mile; The Conversion of Statute Into Nautical Miles and Vice Versa; Running on Time; Sounding; The Lead; The Hand Lead; Manner of Marking the Lead Line; The Deep-Sea Lead; Methods of Sounding; The Sounding Machine; The Depth Recorder; Importance of Using the Lead.

CHARTS: Their Construction and Use; General Charts; Special Charts or Plans; The Polyconic Chart; Charts on the Mercatorial or Mercator's Projection; Wright's Graphic Explanation; Meridional Parts; Charts in Use on the Great Lakes; How to Use Charts; The Parallel Ruler; The Dividers; The Course Protractors; To Lay Down a Position on the Chart; To Find the Latitude and Longitude of a Place or Position on the Chart; To Find the Distance Between Any Two Points on the Chart; To Find the Course and Bearing Between Any Two Points on

the Chart; To Find the Ship's Position on the Chart When the Course and Distance From Any Given Place Is Known; To Lay Off the Ship's Position on the Chart by Cross-Bearings; Simple Method of Constructing a Mercator's Chart; Illustration.

Lake Navigation (Part 3)

THE SEXTANT: Angular Distance; Instrument for Measuring Angular Distances; Brief Description of the Sextant; The Index Error; How to Read the Sextant; Measurement of Horizontal Angles.

DETERMINING THE POSITION OF A SHIP WHEN IN SIGHT OF LAND: By a Single Bearing and Estimated Distance; By Means of Cross-Bearings; by Means of the Isosceles Triangle and "Four-Point" Bearing; By Means of Two Bearings of the Same Object; Explanation; Illustrative Example; To Find the Distance of a Ship From the Base of a Mountain Peak or Lighthouse of Known Height; To Find the Distance of the Ship From a Known Object Seen on the Sea Horizon; To Find the Position of a Ship on the Chart in Misty or Foggy Weather by Means of a Line of Soundings; The Danger Angle; The Vertical Angle; The Horizontal Danger Angle; Application of the Vertical Danger Angle; Explanation; Illustrative Example; Application of the Horizontal Danger Angle; Explanation; Illustrative Example; Comparison of the Two Methods; The Station Pointer; How to Use the Station Pointer; The Position Finder.

DETERMINING THE POSITION OF A SHIP WHEN NOT IN SIGHT OF LAND: Plane Sailing; Introductory Remarks; Explanation and Principles; Plane Sailing; Solution by Traverse Tables; Examples Relating to Plane Sailing Worked Out in Detail; Parallel Sailing; Explanation; Relation Between Latitude, Departure, and Difference of Longitude; Use of Traverse Tables in Solution of Problems; Illustration; Middle-Latitude Sailing; Explanation; Application of Traverse Tables; To Find the Middle Latitude Classification of Cases; To Find the Latitude and Longitude In When the Latitude and Longitude Left and the Course and Distance Run Are Known; To Find the Course and Distance Between Any Two Places, the Latitude and Longitude of Each Being Known; Working a Traverse; Explanation; Construction of a Traverse; Illustration; Solution by Construction; Courses Should Be True; Taking the Departure Course; The Departure Course; Illustrative Examples Worked Out in Detail; Examples for Practice.

Lake Navigation (Part 4)

TO FIND THE DEVIATION OF THE COMPASS BY BEARINGS OF THE SUN: Explanation and Principles; How Bearings Are Obtained; Explanation of Astronomical Terms; The Amplitude; The Azimuth; The Declination of a Celestial Body; Limitation of the Sun's Declination; The Amplitude Table; To Find the Deviation by an Amplitude Observation; Directions How to Observe and Name the Deviation; Illustrative Examples; To Find the Deviation by an Azimuth Observation; Explanation; Apparent Time; Apparent Noon; Mean Time; The Equation of Time; To Find the Apparent Time When Mean Time Is Known; Standard Time; Classification of Standard Time; Time Signals; Azimuth Tables; To Find the Local Apparent Time Corresponding to the Time Shown by the Clock; The Time Azimuth Method; Directions for Observing; Illustrative Examples Worked Out in Detail, Each Accompanied by a Diagram; To Lay a Ship's Head by an Uncorrected Compass to Correspond With Any Desired Magnetic Direction; Illustration; Field's Course Corrector.

NOTES RELATING TO THE PROPULSION OF VESSELS: Pitch and Slip of the Screw Propeller; Examples; Pitch; Explanations; To Find the Pitch of a Screw Propeller; Examples; To Find Whether a Propeller Is Constructed With Expanding Pitch or as a True Screw; Conclusions; Slip; To Find the Percentage of Slip; Speed of Vessels; Explanation of Terms Used in Formula; Indicated Horsepower; Tonnage and Displacement; Gross Tonnage; Net Tonnage; Speed Problems; To Find the Revolutions at Which to Run the Engine in Order to Attain a

Certain Speed; To Find the Number of Revolutions the Propeller Should Make in Order to Advance at a Required Rate of Speed, the Pitch Being Known; Examples; Notes on Fuel Consumption; Turning Effects of the Screw and Rudder; Single Screw; Ship and Screw Going Ahead; Ship and Screw Backing; Ship Going Ahead, Screw Backing; Ship Going Astern, Screw Working Ahead; Twin Screws; Ship and Both Screws Going Ahead; Ship Going Ahead and Both Screws Backing; One Screw Working Ahead and the Other Screw Backing; Concluding Remarks; Engine-Room Signals.

Lake Navigation (Part 5)

CURSORY TREATMENT OF THE CAUSE OF STORMS AND THE BAROMETRIC CHANGES ATTENDING THEM: The Atmosphere; Heat; Temperature; The Thermometer; Explanation of Principles; How the Thermometer Is Graduated; The Barometer; The Mercurial Barometer; How to Read Off a Mercurial Barometer; The Aneroid Barometer; Adjustment of Ship's Barometers; Atmospheric Pressure on the Great Lakes; Storms and the Handling of Vessels in Storms; Importance of Predicting an Approaching Storm; The Barometric Changes Attending a Storm; Mean Barometric Pressure; The Formation of Storms; The Storm Center; Average Storm Track; Wind and Weather in the Various Parts of the Storm Area; Rotation of Wind; Bearing of the Storm Center; Management of a Vessel in Storm; Rule for Heaving To; Further Differences Between the Front and Rear of the Storm; Useful Suggestions Relating to the Handling of Steamers in Heavy Weather; To Lie-to a Steamer in a Gale; The Use of Oil in Stormy Weather; The Drag or Sea Anchor; Jury or Temporary Rudder; United States Storm Signals; Explanation of Storm Warnings; Hurricane Warning; United States Storm Warning Stations; Canadian Storm Signal; Day Signals; Night Signals; Canadian Storm Warning Stations; Pilot Rules for Great Lakes and Connecting and Tributary Water as Far East as Montreal; An Act to Regulate Navigation on Great Lakes and Connecting and Tributary Waters.

INSTRUCTIONS TO MARINERS IN CASE OF SHIPWRECK: The Life-Saving Service; General Information; Rescue With the Life Boat or Surf Boat; Rescue With the Breeches Buoy or Life Car; Signals Adopted by the Life-Saving Service; Recapitulation; List of Life-Saving Districts and Stations on the Great Lakes; Carrying Capacity of Life Boats; Regulations Relating to Life Boats; The Station Drill; Fire Drills; The Official Log; Directions for Restoring the Apparently Drowned; Instruction for Saving Drowning Persons by Swimming to Their Relief.

A Word to Owners and Port Captains

The successful operation of any ship or any fleet of ships depends in no small degree on the efficiency of the officers and crew in charge.

Intelligent and well trained crews from the skipper down mean better service, better handling of ship and cargo, resulting in an economic saving to the owners. A man who in an emergency can, by his knowledge, avert a threatening disaster is a valuable asset to any steamship company. Trouble nipped in the bud with the help of men technically trained may mean the saving of large repair bills later on.

For many years the I.C.S. have trained men to become more skilled. Our Courses in Navigation, Marine Engineering, Electrical Engineering, Steam and Gas Engineering, and Radio Work have made it possible for the slow, the unskilled, and the untrained to become alert and efficient men—men it has been a pleasure for many steamship companies to promote to highly responsible positions.

Benjamin W. Lockett, chief engineer of the beautiful Santa Paula, of the Grace Lines, and the officers of his staff. Mr. Lockett is the fourth man from the left in the front row.

MODERN steamship lines select their men with care and promote them as occasion arises when they have proved that they have the ability to "deliver the goods."

Benjamin W. Lockett won his position through sheer ability. Whenever he finds a man who is doing less than his best Mr. Lockett advises that man to get busy and get knowledge that will make his head useful for something other than a hat support.

Mr. Lockett was a machinist when the war broke and he went into the U. S. navy. That was the beginning of a career at sea. It was also the beginning of much spare-time study that brought rapid advancement. He has spent hours in the study of I.C.S. texts and has found them good. He says:

> "Trained minds are not plentiful. That is, of course, just another way of saying that there is plenty of room at the top. There *is* plenty of room at the top, but you don't get there by wishing and dreaming. It takes good mental sweat. And there are many, many men who, today, are envying those in better positions than themselves who would have one of those better positions if they were willing to work for it. That is the whole sum and substance of advancement—the ambition to get somewhere and the willingness and the will-power to work and study."

Marine Engineers' Course

THIS Course is intended for engineers, coal passers (or trimmers), firemen (or stokers), water tenders, oilers (or greasers), and other employes of steam vessels. A graduate of this Course will understand the principles of combustion and economic firing; the calculations relating to safety-valve problems and strength of boilers, and the operation and management of marine engines, electrical and refrigerating apparatus. He will be prepared to pass the marine license examination for any grade to which he is eligible by law. Every employe in the engineers' department of a steam vessel will derive substantial benefit from this Course. It has just been thoroughly revised, and has been extended to better cover the marine-engineering field. The list of subjects below shows the comprehensiveness of the Course.

Subjects Taught

Practical Mathematics
Mensuration
Principles of Mechanics
Machine Elements
Mechanics of Fluids
Strength of Materials
Heat and Steam
Types of Marine Boilers
Marine-Boiler Details
Marine-Boiler Accessories
Liquid Fuel
Economic Combustion
Marine-Boiler Feeding
Marine-Boiler Management
Marine-Boiler Repairs
Marine-Boiler Inspection
Screw-Propeller Engines
Paddle-Wheel Engines
Marine-Engine Indicating
Engine Testing
Marine Slide-Valve Gears
Marine Condensers
Multiple-Expansion Marine Engines
Marine-Engine Management
Marine-Engine Repairs
Steam Turbines
Auxiliary Marine Machinery
Marine Pumps
Propulsion of Vessels
Refrigeration
Electricity and Magnetism (2 Parts)
Theory of Direct-Current Generators and Motors
Direct-Current Generators
Direct-Current Motors
Direct-Current Machinery Operation
Shop Blueprints*
Machine Sketching*

Subjects marked * are optional

The License Examinations

Opportunities for advancement in marine engineering are open to none but the men that have engineers' licenses of the grades that the positions require. These licenses cannot be obtained unless the applicants have had actual sea service and have passed a rigid examination; for the governments of the world insist on ship owners employing men that have the technical knowledge necessary to safely run modern marine machinery.

By the United States government, steam vessels of its merchant marine service are divided into five classes. Engineers of these five classes of steamers are classified into sixteen grades. Every one of these engineers must have a license covering the grade required for the position and the class of vessel he is engaged on. Through the study of our Course, you can, in a very reasonable length of time, gain the technical knowledge of marine engineering required by the United States and Canadian governments as a prerequisite to license. The I.C.S. system provides a way to obtain the desired knowledge without loss of time from work.

The instruction is practical and thorough. The lessons make clear those things which the modern engineer must know in order to derive the greatest possible power and at the same time effect a saving in fuel. Engineers of broad experience and recognized ability here present effective methods of supervising and maintaining the power plant of a modern vessel.

Harry Talbot, First Assistant Engineer of the majestic, electric-drive, twin-screw ship Chiriqui of the United Fruit Company's "Great White Fleet."

IT took more than luck to bring about the rise of Harry Talbot, in only six years, from oiler on a ship to First Assistant Engineer of the great, modern, electrically-driven *Chiriqui* of the United Fruit Company's splendid fleet.

Mr. Talbot studied everything he could get his hands on that dealt with ships' motive power. But such odds and ends of information did not serve his purpose. He required a more orderly arrangement of facts on the subject and found it in the I.C.S. course in which he enrolled (Marine Engineering). He's still at his job of fitting himself for the very best in his line, for there's always something new to learn.

To scores of men—especially the younger men—he is known as "Uncle Harry" because to his example and advice many of them owe their advancement to the positions they hold today.

Study! He knows how necessary it is and how valuable it is!!

Letters From Those That Know

Most Satisfactory Treatise on the Subject

I have gone over the Lake Navigation Course very carefully and will say that, without doubt, it is the most satisfactory treatise on the subject that could be compiled. The work reveals a master hand and, as a whole, furnishes the most thorough and masterly education that could be devised for the mariner on the Great Lakes, who stands greatly in need of such an education, but to whom it has heretofore been inaccessible.

CAPT. FRANK HENRICH, Nautical Expert,
In charge Branch Hydrographic Office, Duluth, Minn.

Cordially Recommends I.C.S.

The textbooks of Navigation and Nautical Astronomy prepared by you for the International Correspondence Schools, were received in due course, and in order to obtain the judgment of a practical navigator I requested one of our Inspectors, Captain C. S. Dunning, to make a thorough examination of the books and give me his opinion of them.

I take pleasure to enclose herewith copy of a communication from him on the subject, by which you will observe that he states the books are particularly well adapted to the use of those wishing to educate themselves in these branches without the aid of a teacher. His further comments on the books appear to strongly recommend them for the purpose named.

It therefore affords me great pleasure not only to commend your School, but also to be of any service to you in extending its usefulness in the sphere in which your system of instruction may be extended.

A. A. RAVEN, President, Atlantic Mutual Insurance Company

Captain Dunning's Criticism

A. A. RAVEN, President, Atlantic Mutual Insurance Co.

Dear Sir:—After a careful examination of the books on mathematics, nautical astronomy and navigation, which you recently handed me to look over, I am pleased to say I consider them particularly well adapted to the use of those wishing to educate themselves in these various branches without the aid of a teacher. The difficult task of self-education in mathematics and navigation is made as easy, it seems to me, as it is possible to be made.

The treatment of the compass and its errors with method of correction is thorough and complete. The method for the construction and use of the chart is made plain and easy to be understood. The directions for star observations are useful. The Rodenian time diagram is especially valuable. The parts of the work dealing with nautical astronomy are clear and such as to give the student an intelligent understanding of the subject. The explanations and definitions of astronomical terms and systems are very explicit. The subjects of winds, tides, and currents are treated in an able and instructive manner. The use of the lead is (as it should be) strongly emphasized. All the standard methods and tables for determining latitude and longitude are used, thus insuring accuracy.

In addition to the good points named above, the books are excellently arranged for reference and have a most satisfactory and complete set of indexes.

Yours respectfully,
C. S. DUNNING

WE WELCOME YOU AS A STUDENT

WHEN your enrolment for an I.C.S. course reaches us it signifies that you have resolved firmly in your own heart to advance. Enrolment is the first great step ahead. Other steps will follow and we, with our years and years of experience, welcome the opportunity of helping you to take them.

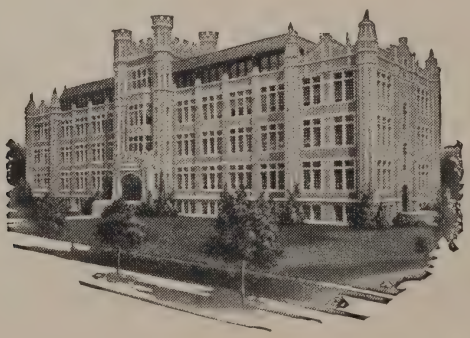
The only qualification we require is the ability to read and write and a willingness on your part to do your best.

Each I.C.S. course is arranged scientifically and logically. Each subject is included because it is necessary to complete training. No reduction in the price of Scholarships is made because one may already be informed on certain subjects, but by taking examinations or submitting satisfactory proof of proficiency it is possible to omit regular work on preliminary subjects in which one may be sufficiently prepared.

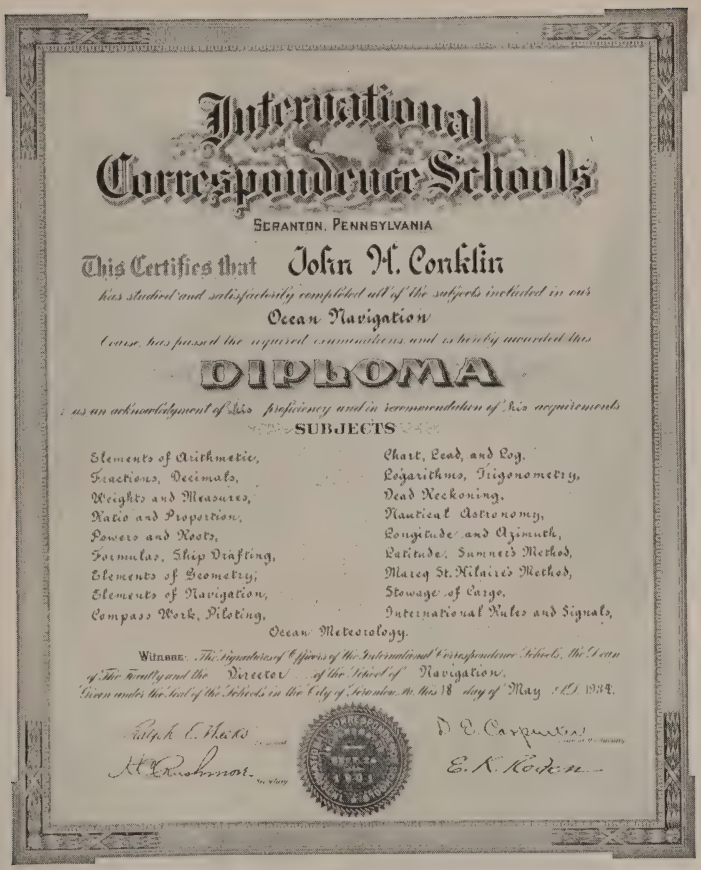
Post-Office Money Orders, Express Orders, and Bank Drafts should be made payable to the **International Correspondence Schools, Scranton, Pa.**

There are no books to buy. I.C.S. texts are complete in themselves. The expenses, other than the price of the courses, are limited to the cost of the paper on which to write answers to the questions, the postage to send these answers to the Schools, and, in some of the courses that require Drawing, Chemistry, etc., a small amount for inexpensive instruments and apparatus.

Your work will be sent to us in sealed envelopes (which we furnish as a part of your course) as "first-class mail matter," the rate for which is 3 cents for each ounce or fraction thereof, prepaid. This expense rarely exceeds 15 cents a month. We pay all the postage on Instruction Texts, letters, etc., that we send to you.



A Diploma That Means Something



International Correspondence Schools

SCRANTON, PENNSYLVANIA

This Certifies that John H. Conklin

has studied and satisfactorily completed all of the subjects included in our

Ocean Navigation

Course, has passed the required examinations and is hereby awarded this

DIPLOMA

as an acknowledgment of his proficiency and in recommendation of his acquirements

SUBJECTS

Elements of Arithmetic,	Chart, Lead, and Log.
Fractions, Decimals,	Logarithms, Trigonometry,
Weights and Measures,	Dead Reckoning,
Ratio and Proportion,	Nautical Astronomy,
Powers and Roots,	Longitude and Azimuth,
Formulas, Ship Drafting,	Latitude: Sumner's Method,
Elements of Geometry;	Marcq St. Hilaire's Method,
Elements of Navigation,	Stowage of Cargo,
Compass Work, Piloting,	International Rules and Signals,

Ocean Meteorology.

Witness: The Signatures of Officers of the International Correspondence Schools, the Dean of the Faculty and the Director of the School of Navigation.

Given under the Seal of the Schools in the City of Scranton, this 18 day of May A.D. 1904.

Ralph C. Davis — D. C. Carpenter

H. W. Rushmore — E. V. Hoskins

The I.C.S. Diploma stands for training that has been gained through painstaking study of a strong course. It signifies that the owner is possessed of ambition, perseverance, and determination necessary to succeed in his chosen field. Such persons can be relied on because they have learned to rely on themselves. This diploma is given only for meritorious work; it is evidence that the man who holds it has been a faithful student and possesses the education set forth, and it is frequently a passport to highly coveted recognition and success.

A Message For You

ON SHORE or at sea you can study these Courses of the I.C.S. and prepare for the higher positions open to trained men. On the great lakes of the inlands, on the rivers and along the coasts, on the high seas and in practically every port where ships may enter, there you will find men on vessels of all kinds and all tonnage studying in order to better fit themselves for advancement. From the forecastle to the bridge and in other positions of command you will find men who owe their advancement and success to the spare time hours spent in the study of I.C.S. Courses.

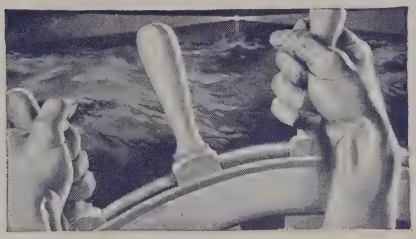
Are you fully satisfied with what you are doing and the way you are doing it? Is it a way which will mean sure advancement to a higher position, to greater honor, to bigger earnings? It matters not what your early education may have been, how much you have missed or how much you have acquired. If you can read and write English we can teach you successfully.

If you wish to fill a higher position consider what it will be worth to you to study with an institution which has for many years been successful in preparing men for advancement; consider what it will be worth to study under the personal supervision of our trained and experienced instructors; what it will be worth to you in the years to come to get the training now which has meant so much to hundreds and thousands of other men—and which will mean as much to you.

Photo, Courtesy Georgian Bay Line

S. S. South American

Your Future is in Your Own Hands



Today is yours!

Tomorrow will bring with it new problems and new opportunities.

We know to a certainty that men and women who have prepared themselves are preferred above all others—and are employed and promoted above all others. And the way to secure this training has been pointed out to you in this booklet.

Whether you reach your objective of success is for you to determine. To an extent—and to a very great extent—you *can* foretell your own future. If *greater success* is your objective, then study, training, persistence and decisive action are required NOW in the winning of it.

The facilities of this Institution have helped thousands of others to win. And these facilities are *yours* the minute you enroll.

Photo, Courtesy of United Fruit Lines

45L—938-3m PRINTED IN U.S.A.

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